Having settled these details, Eiffel established several forms of hygrometer and carried out comparative observations, from which he concludes that the Lambrecht polymeter and thermohygroscope as well as Lambrecht's weather telegraph with rules based on the observed temperature, pressure, moisture, and wind, give prognostics that are generally exact. American observers in a much drier climate have not reported so favorably.

The remaining chapters of this volume are devoted to the rain, clearness of the sky, the wind, and the barometer, followed by appendices giving tabular summaries of the observations from 1879 to 1903. A separate volume of diagrams and charts accompanies the text.

METHODS OF TEACHING METEOROLOGY.

Numerous requests are received from those giving limited courses of instruction, both Weather Bureau officials and nonofficial teachers, asking for sets of lantern slides to illustrate lectures; card indexes to current literature; and various publications bearing on meteorology with the idea that all these will help to keep the instructor informed as to the latest discoveries and will also enable him to give popular public lectures.

It seems to the Editor that the instruction in meteorology given in most of our schools and colleges needs to be of a fundamental, solid, character, and not of the popular superficial character appropriate to lectures that are illustrated by lantern slides. The study of the subject as expounded in the textbooks of Davis, Waldo, Ward, Hann, and others implies considerable intense thought. Laboratory experiments will often be very useful in elucidating the subjects of moisture, rainbows, halos, waterspouts and tornadoes; carefully drawn charts elucidate hurricanes; actual work with thermometers and perhaps with kites will interest every student in the distribution of temperature in the atmosphere; but a lecture with stereopticon illustrations should only come in as a sort of luxury once or twice during the course. It is really not at all essential. It is especially important for the teacher himself to be so interested in his subject as to devise his own diagrams and apparatus, at least some of them. Almost anyone can make a crude nephoscope out of a bit of mirror, or the cover of a tin pail turned over and filled with water. It is not necessary to buy a $50 barometer in order to explain or observe the variations of atmospheric pressure. It is only after one has taught in his own original way for several years that he begins to realize the power of his own ingenuity and finds that he is doing better with crude material than many another man is doing with an elaborate equipment. If the educational apparatus that he devises is copied, manufactured, and sold to other teachers by some enterprising, money-making firm, that simply proves that some are intellectually sluggish and do not push their own school work on the independent, original basis that he himself does. There is no reason why the Weather Bureau officials should not take the lead in devising the best methods of teaching meteorology and climatology.

THE RAINFALL OF MEXICO.

The Annals of the Association of Engineers and Architects of Mexico has published in its twelfth volume, among many other interesting papers on engineering, one by Romulo Escobar, on the "Regimen of the Rainfall of Mexico." He gives in detail all accessible special items relative to the measurements of rainfall for a large number of stations. What particularly interests us is the comparative table from which we have made the following abstract showing the average rainfall for each successive lustrum. In place of taking an indiscriminate average of many years at one station and a few years at another we are able now to compare the simultaneous rainfalls at different places, and indeed if there were only stations enough, or if Mexico had not such a very irregular orography, one might be able to reduce the whole system of measurements to one uniform fundamental period of standard lustra, such as, for instance, as 1881–1900, inclusive. Among his general conclusions, Escobar calls attention to the fact that most stations show a steady diminution for a long period of years, but that this has already begun to be followed by an increase. A similar diminution has been observed in our Gulf States from Texas to Alabama and Tennessee, but perhaps the subsequent increase that may be expected has not been everywhere observed owing to the frequent changes in our rain gages and their exposures.

Average annual rainfall, by lustra, with number of years of record. Amounts in millimeters.

Stations.	Before 1877.	1877–1881.	1882–1886.	1887–1891.	1892–1896.	1897–1901.
Hacienda el Carmen						5 684.8
Querétaro		5 623.8	5 518.3	5 486.4	5 386.1	5 430.8
Zapotlán					3 805.0	5 977.5
Linares					1 796.0	5 844.6
Aguascalientes		1 418.4	5 607.1	1 542.2		
Guanajuato		1 893.5	5 818.9	5 721.7	5 526.5	4 680.0
Jalapa					3 1334.3	4 1657.9
Morelia			1 648.8		3 661.5	5 703.7
Oaxaca		3 715.3	4 716.7	5 943.5	5 804.9	2 862.2
Tepic	19 1433.7		2 2301.7	5 1435.1	3 1334.3	
San Luis Potosí		4 403.9	5 365.2	5 426.2	5 284.6	4 303.8
Huejutla			5 1175.1	3 1538.1		
Pabellón		5 515.6	5 499.9	4 581.6		
Tacubaya			3 585.0	5 773.4	5 533.8	4 660.5
Real del Monte				3 873.0	5 606.1	4 835.3
Teziutlán		3 1716.8	2 1251.9	1 2268.2		
Túxpan		2 1549.0	3 1197.1	3 1584.7		
Mérida				2 887.5	5 801.9	5 924.5
Monterey			2 422.2	5 335.2	5 398.2	5 712.9
Mazatlán		2 1201.4	5 842.7	5 758.7	5 669.2	5 794.4
Colima		4 1045.5		1 1233.0	5 821.0	4 1000.9
Pachuca					4 293.9	5 2254.4
Puebla, Col. Católico		5 1144.9	5 1258.2	5 1373.1	5 988.4	5 893.3
Puebla, Col. del Estado		4 963.4	5 860.3	5 969.4	5 821.5	5 810.9
México	15 671.3	5 566.2	5 589.0	5 651.4	5 471.1	5 577.9
Toluca			2 678.0		5 671.7	5 681.0
León		4 691.5	5 745.1	5 743.2	5 504.0	5 565.9
Saltillo			5 500.0	5 597.7	5 641.9	5 441.5
Guadalajara	3 810.3	5 941.5	5 829.9	5 992.0	5 1487.5	4 1493.1
Zacatecas		4 655.5	5 898.2	5 811.6	5 302.0	5 593.6
Galveston, Tex		4 1219.5	5 1269.6	4 1159.1	5 830.4	4 1159.9
El Paso, Tex		3 331.6	5 278.7	4 164.2	5 205.3	4 214.7
Yuma, Ariz		4 50.1	5 91.7	1 90.2	5 68.8	4 50.3

TEMPERATURES ON MOUNT ROSE, NEV.

Prof. J. E. Church of the University of Nevada at Reno, Nev., has made an effort to obtain a record of temperatures on the summit of Mount Rose, whose elevation is approximately 10,800 feet, latitude 39° 20′ north, longitude 119° 55′ west. Maximum and minimum thermometers were established in a small thermometer shelter at the summit toward the end of June and will be visited and reset as often as practicable. The record for the first three months is as follows:

Between June 29 and August 24, maximum 71.2°, minimum 24.0°.

Between August 4 and September 4, maximum 70.8°, minimum —2°.

Between September 4 and October 7, maximum 65.5°, minimum —4.5°.

At the last reading a partial coating of ice was found on the bulbs of both thermometers and the actual reading of the minimum thermometer at that time after resetting was 23° and a stiff wind was blowing. Ice crystals an inch long fringed the shelter.

A rain gage is also established at the same place and the total accumulated precipitation during the three above mentioned intervals was 0, 0.41, and 0.08 inch, respectively. On October 7, snow lay on the ground in small patches from 2 to 15 inches deep.

Professor Church noted on September 4 that wild currants on the summit were ripe and daisies were still yellow in spite of the temperature of —2°.

The low temperature, —4° F., during the month of August at the summit seems at first in striking contrast to the hot weather experienced in the lowlands, but is fully explained by considering all the circumstances that go to determine the temperature of any layer of air in the atmosphere. Of course in lowlands minima mostly occur at nighttime and are mainly due to the influence of radiation of heat from the ground. Cooling by radiation takes place far more rapidly from the rocky surface of a mountain than from a particle of air distant therefrom. The cold air chilled by contact with and by radiation to the mountain surface flows to a lower level and continues cooling while a fresh supply takes its place; therefore temperatures fall much lower in shallow basins where the cold can intensify than they do on pinnacles of rock where no accumulation of quiet cold air and no intensification of cold can take place. Temperatures will fall to an unexpected degree if air or water is kept in a shallow basin which can lose by radiation but can gain none by convection. The mountain winds or valley winds that begin to be felt in the afternoon and continue strong during the whole night represent the downflow of cool air from the upper parts of the mountain whose forests or rocky soils are cooled by radiation. This descending cool air is warmed up by compression as it comes under greater atmospheric pressure and the rate of warming averages very nearly one degree Fahrenheit for each 186 feet of descent, but if it receives a little heat from other sources, or if it mixes with the warmer air of the lowlands this rate of warming may be one degree for 150 feet or even 100 feet; thus at Reno itself, whose station is 4484 feet above sea level and 6316 feet below the summit of Mount Rose, we should expect to find differences of at least 40° or 60° between the two places and if the location of the thermometer on the summit is such that it comes under the special influence of local radiation, then the differences may be greater to almost any extent. It is even possible that a special cold wind from the north such as occurs in our areas of high pressure and cold waves may bring temperatures to the summit of the mountain for a few hours during clear hights such as are out of all proportion lower than those of lower stations.

The lowest temperature recorded at the State University during the interval, August 4–September 1, was 46° and this would ordinarily correspond to something between 16° and 26° at the summit. The difference between this and the observed record of —2° is probably to be attributed in part to the great radiation taking place from the rocks of the summit and the imperfect ventilation within the thermometer shelter, but largely to the fact that there pass over mountain top masses of air that are very cold but do not of themselves settle down into the valley below. They come with the areas of high pressure, spread out horizontally mostly southward and southeastward or even eastward with great velocity and descend to the earth on a very gentle gradient, so that by mixture and solar radiation they are warmed up before reaching the cold stratum covering a distant lowland region. Such low temperatures are common on all the mountain peaks although the lowest temperatures will happen in the lowlands if cold air accumulates at nighttime and the warmer air has to stay above it. Balloon work has shown that there may exist even three or four alternations of temperature along the vertical and that therefore the atmosphere is often in unstable equilibrium within a definite special range of elevation.

PROTECTION FROM FROST.

Mr. A. C. Bennett, a Wisconsin cranberry grower, writing under date of May 15, 1905, describes the methods used by him for the protection of his cranberry marshes against frost as follows:

> At Cameron, Wis., I have a large marsh almost entirely surrounded by banks 25 to 35 feet high, with sloping sides. I have a fine trout stream for my water supply. My principal reservoir is northwest of the plantation, and I divert the creek from its old bed and carry it around outside of the marsh, forming a succession of reservoirs entirely surrounding the marsh on its border, from 5 to 30 rods wide.
>
> The cold air as it slides down the high surrounding banks must cross the reservoirs of water and pass over the dams before it can reach the vines. The outlet of the marsh is through a ravine at the south, and gives air drainage to the Menominee River.
>
> I think this would be an ideal place to test the plan of fencing off the upland cold air, also the plan of adding humidity to the air by using the water in the creek to run sprayers as it comes from the large reservoir northwest of the planted marsh.

PUBLICATION OF THERMOGRAMS IN FACSIMILE.

The San Diego Chamber of Commerce has shown its interest in the study of the climate of that region by issuing a monthly sheet embodying a photographic reduction of the complete thermograph record for the month and also the regular Monthly Meteorological Summary as furnished by Mr. Ford A. Carpenter, the Official in Charge of the Local Office of the Weather Bureau at San Diego.

This offers striking evidence of the temperature conditions at San Diego and will be very convenient for the use of those who desire to compare local temperatures with hygienic and crop conditions.

STRUCTURE OF HAILSTONES.

A curious fact was noted some years ago by a close observer, namely, that hailstones when melting away in a pail of water end their career by giving up a large bubble of air which had evidently been enclosed under great pressure in the white snow that forms the center of the hailstones. We hope that many of our observers, regular or cooperative, may have the opportunity to repeat this observation and will send us the results, whether positive or negative. Observe as closely as possible the size of the cavity that appears to contain the air and also the size of the bubble of air as it ascends through the water. In fact the latter measurement may be made quite easily by using soap suds instead of pure water and measuring the size or volume of the soap bubble. Many hailstones should be measured so that we may figure on the variations that must occur between them.

THE PAGOSCOPE VERSUS THE DAILY WEATHER MAP.

Pagoscope is the name of a new device for popular use in France tending to lighten the labor of deciding whether there is danger of a severe frost during the approaching nighttime. The instrument attempts to show at a glance whether the prevailing dew-point is below freezing, or 32° F., and leaves it to the observer to infer that if below freezing then a frost is pos-